Customer No.: 31561
Application No.: 10/709,036
Docket No.: 12476-US-PA

To the Drawings:

Please substitute the attached amended drawing of Fig. 2B for the pending drawing of Fig. 2B. The amended portion is changing the label "Cn" to "Cu".

REMARKS

Present Status of the Application

The drawings are objected to because the label "Cn" is required to amend into "Cu" in Fig. 2B. The specification and claim 16 are objected to because appropriate corrections are required. In addition, the Office Action rejected claims 1-5, 7-9, 16-18 and 21-22 under 35 U.S.C. 103(a), as being unpatentable over Davis (US 5,280,414) in view of Ivey (US 6,797,409). The Office Action rejected claims 10 and 15 under 35 U.S.C. 103(a), as being unpatentable over Davis in view of Coult (US 5,990,560). The Office Action rejected claim 14 under 35 U.S.C. 103(a), as being unpatentable over Davis and Ivey in view of Kajiwara (US 2002/0056906). The Office Action rejected claims 23 and 28 under 35 U.S.C. 103(a), as being unpatentable over Davis and Ivey in view of Coult. The Office Action rejected claim 27 under 35 U.S.C. 103(a), as being unpatentable over Davis and Ivey in view of Kajiwara.

Applicants have amended the drawings and the specification to correct the typographic errors.

Applicants have amended claims 1 and 16 and canceled claims 2-5 and 17-20 to more clearly define the present invention. After entry of the foregoing amendments, claims 1, 6-16 and 21-28 remain pending in the present application, and reconsideration of those claims is respectfully requested.

Discussion of Office Action Objections

The drawings are objected to because the label "Cn" is required to amend into "Cu" in Fig. 2B. Applicant has amended the label "Cn" into "Cu" in Fig. 2B to overcome the objection.

The specification is objected to because paragraph [0033] lists three layers and four thicknesses, and therefore it is unclear which thickness concerns each layer. Applicant has added "the gold layer" after the tin layer so as to interpret the 2.13 um disclosure to concern this layer.

Claim 16 is objected to because "the % weight ratio" lacks antecedent basis. Applicant has amended "the % weight ratio" into "a % weight ratio" to overcome the objection.

Rejections under 35 U.S.C 103 (a)

Applicant respectfully traverses the rejection of claims 1-5, 7-9, 16-18 and 21-22 under 103(a) as being unpatentable over Davis (US 5,280,414) in view of Ivey (US 6,797,409) because a prima facie case of obviousness has not been established by the Office Action.

> To establish a prima facie case of obviousness under 35 U.S.C. 103(a), each of three requirements must be met. First, the reference or references, taken alone or combined, must teach or suggest each and every element in the claims. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skilled in the art, to combine the references in a manner resulting in the claimed invention. Third, a reasonable expectation of success must exist. Moreover, each of the three requirements must " be found in the prior art, and not be based on applicant's disclosure." See M.P.E.P. 2143, 8th ed., February 2003.

The present invention is related to a method of forming a method of forming a bond microstructure as claims 1 and 16 recite:

1. A method of forming a bond microstructure, comprising:
sequentially forming a tin layer and a gold layer on one of two members, a % weight ratio of tin to gold being 20:80 having a variation range of about ±3~4%; and
treating the tin layer and the gold layer with a first temperature of no more than 280°C or a second temperature of higher than 280°C to form bond microstructures having different characteristics, wherein ***when the tin layer and the gold layer are treated with the first temperature, the bond microstructure will have a layered structure comprising an AuSn layer and an Au_5Sn layer*** and ***when the tin layer and the gold layer are treated with the second temperature, the bond microstructure will have an eutectic structure containing AuSn and Au_5Sn***.

16. A method of forming a bond microstructure, comprising:
sequentially forming a tin layer and a gold layer on two members respectively, a % weight ratio of tin to gold being 20:80 having a variation range about ±3~4%; and
treating the tin layer and the gold layer with a first temperature of no more than 280°C or a second temperature of higher than 280°C to form bond microstructures having different characteristics, wherein ***when the tin layer and the gold layer are treated with the first temperature, the bond microstructure will have a layered structure comprising an AuSn layer and an Au_5Sn layer*** and ***when the tin layer and the gold layer are treated with the second temperature, the bond microstructure will have an eutectic structure containing AuSn and Au_5Sn***.

Davis and Ivey fail to teach or suggest that when the tin layer and the gold layer are treated with a temperature no more than 280°C, the bond microstructure will have a layered structure comprising an AuSn layer and an Au_5Sn layer and when the tin layer and the gold layer are treated with a temperature higher than 280°C, the bond microstructure will have an eutectic structure containing AuSn and Au_5Sn. . Davis just teaches AuSn20wt.% can be melted at lower than 280 degree C (such as 218 degree C or 257 degree C shown in Fig. 2) or higher than 280

degree C (such as 287 degree C shown in Fig. 2 or 490 degree C described in col. 5, lines 14-16). But Davis fails to teach or suggest a layered structure comprising an AuSn layer and an Au_5Sn layer can be obtained if a tin layer and a gold layer are treated with a temperature no more than 280°C. Davis also fails to teach or suggest an eutectic structure containing AuSn and Au_5Sn can be obtained when a tin layer and a gold layer are treated with a temperature higher than 280°C.

The office action stated Ivey teaches that "it can be readily seen that a combination of AuSn and Au_5Sn can readily produce a layered composite material..... (col. 6, lines 51-54)". However, applicant respectfully submits Ivey fails to teach forming an eutectic structure containing AuSn and Au_5Sn by treating a tin layer and a gold layer with a temperature higher than 280°C. Ivey teaches by selection of the first current plating time interval and the second current plating time interval, AuSn and Au_5Sn can be electrodeposited as a layered composite material (col. 6, lines 55-58). In other words, in the Ivey reference, the layered composite material including AuSn alloy phase and Au_5Sn alloy phase is formed with an electrodeposition /electroplating process (see abstract), and the electroplating is carried out at a fixed temperature of 20°C (see col. 18, lines 35-36).

Therefore, applicant respectfully submits the two references combined so not teach or suggest each and every element in claims 1 and 16. For at least the foregoing reasons, Applicant respectfully submits that independent claims 1 and 16 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 6-15 and 21-28 patently

define over the prior art as a matter of law, for at least the reason that these dependent claims contain all features of their respective independent claim.

In particular, both Davis and Ivey fail to teach or suggest the limitation of claims 6 and 21 which is the step of treating the tin layer and the gold layer with the first temperature of the second temperature comprises heating under pressure or a reflowing method. Ivey teaches the layered composite material including AuSn alloy phase and Au_5Sn alloy phase is formed with an electrodeposition /electroplating process, which is much different from the method of heating under pressure or reflowing.

Applicant respectfully traverses the rejection of claims 10 and 15 under 35 U.S.C. 103(a), as being unpatentable over Davis in view of Coult (US 5,990,560); the rejection of claim 14 under 35 U.S.C. 103(a), as being unpatentable over Davis and Ivey in view of Kajiwara (US 2002/0056906); the rejection of claims 23 and 28 under 35 U.S.C. 103(a), as being unpatentable over Davis and Ivey in view of Coult; and the rejection of claim 27 under 35 U.S.C. 103(a), as being unpatentable over Davis and Ivey in view of Kajiwara because a prima facie case of obviousness has not been established by the Office Action.

Applicant submits that, as disclosed above, Davis and Ivey fail to teach or suggest each and every element of claims 1, 16, from which claims 10, 14, 15, 23, 27 and 28 depend. Coult and Kajiwara also fail to teach when the tin layer and the gold layer are treated with a temperature no more than 280°C, the bond microstructure will have a layered structure

comprising an AuSn layer and an Au_5Sn layer and when the tin layer and the gold layer are treated with a temperature higher than 280°C, the bond microstructure will have an eutectic structure containing AuSn and Au_5Sn. Coult and Kajiwara cannot cure the deficiencies of Davis and Ivey. Therefore, independent claims 1 and 16 are patentable over Davis, Ivey, Coult and Kajiwara. For at the least the same reasons, their dependent claims 10, 14, 15, 23, 27 and 28 are also patentable as a matter of law.

Claims 6 , 11-13, 17-20, 24-25

Applicant respectfully inquires on whether claims 6, 11-13, 17-20 and 24-25 are allowable or not because these claims are not rejected or objected in the office action.

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CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted,

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